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A REPORT ON ROADS AND PAVEMENTS

With Special Reference to the Use of Paving Brick with Various Fillers

THE twentieth annual report of the Illinois Society of Engineers and Surveyors (1905) embraces among other valuable features a report presented by the Committee on Roads and Pavements, consisting of O. L. Gearhart, I. O. Baker and F. L. Hancock. Prof. Baker, of the Illinois University, is so well known an authority on this subject that we deem the present occasion especially appropriate for giving currency to a report for which he is partly responsible. Dealing with

JOINT FILLERS FOR BRICK PAVEMENTS

the report states:

"For the smaller towns or cities, brick pavements are preferred for several reasons: 1, They are easy to construct and maintain. 2, Their first cost is comparatively low. 3, They can be more easily repaired than asphalt in case the street is opened for gas, water or sewer pipes. 4, They are durable. For these reasons this kind of pavement will continue to be used for some time to come, and some expedients for their betterment will be considered. The extremely low price at which Portland cement can be obtained makes it more economical to use a lean Portland cement concrete than a rich natural cement. The former being about 10 per cent. cheaper and 50 per cent. stronger than the latter.

"The proper treatment for the joints of brick pavements is quite important, and yet it is a feature that does not receive the same amount of attention as the selection of the brick or the construction of the foundation. This neglect is probably due to the fact that it has been difficult to obtain a filler which will meet all of the requirements. The interstices between the brick should be filled with a material: (1), to keep the brick in proper position; (2), to lessen the chipping of the corners and edges of the brick; (3), to prevent the water from entering the joints and penetrating to the foundation, and (4), to render the pavement as free from noises as possible.

"Sand was the first filler employed for brick pavements, and is now more extensively used for that purpose than any other material. The advantages of a sand filler are: 1, It is cheap, usually costing not more than 2 cents per

sq. yd. 2, The pavement may be put into use as soon as the brick are laid, and the cement in the foundation set so as not to be damaged by the rolling and the traffic. 3, The pavement may be taken up easily to make any underground repairs without damaging the brick. 4, The pavement will be ironed out under the traffic, and will become smoother after it has been in use for awhile than it was when first thrown open. The disadvantages are: 1, The sand does not protect the corners and edges of the brick and keep them from chipping. 2, It may be washed out on steep grades by the rains and by the flushing of fire hydrants. 3, It may be removed from the top of the joints by the street sweeper or the pneumatic cleaner. In the last two instances, the crevices become filled with droppings and other decaying matter, which is an objectionable feature. 4, The filler does not remain flush with the surface of the brick, causing the passing vehicles to jolt and rattle with considerable roar and noise.

"Next to the sand, in point of extent in use, is the Portland cement grout filler. It is prepared by making a thin mortar of neat cement, or 1 part of cement and 1 part fine sand, the latter proportions being the more common. This mortar is swept into the interstices. Where this filler is used, expansion joints should be provided both transversely and longitudinally. The cost of 1 to 1 Portland cement filler will be from 8 to 12 cents per square yard, the higher price being paid where extraordinary care in mixing and applying was employed. The advantages of a cement filler when it is properly applied are: 1, It thoroughly protects the corners and edges of the brick. 2, It cannot be washed or swept out of the joints. 3, Water cannot penetrate the pavement and reach the foundation. 4, It makes the pavement thoroughly sanitary. 5, It adds about as much strength to the pavement as the ordinary concrete foundation. The objections to the cement filler are: 1, It causes the pavement to rumble when the vehicles are passing over it. The explanation for this rumbling is not satisfactorily explained, and the expansion joints do not entirely eliminate it. 2, It is very hard to tear up and repair the pavement, and the old brick are rendered almost useless. 3, After applying the filler, the pavement should stand from seven to ten days

before traffic is admitted. This causes considerable inconvenience to the occupant of the property, especially in a business district. 4, It prevents the large brick from being settled in the sand cushion by the traffic, thus making the tractive resistance on pavements with cement filler greater than that of a sand filled pavement that has been used for awhile. 5, Considerable attention is required to see that the ingredients composing the filler are perfect and that it is properly applied.

"Another filler for brick pavements is a No. 4, No. 5, or No. 6 coal tar distillate. No. 6 is the grade ordinarily used for this purpose. The tar is brought to the pavement in barrels heated in kettles to a temperature of 300 to 320° F., and poured into the joints from vessels with a small spout or from funnel-shaped cans. The cost of a tar filler is from 10 to 12 cents, depending on the locality of the pavement and the width of the joints. As long as this material remains in place, it keeps the brick in proper position, makes an impervious joint, and does not cause the pavement to rumble. The objectionable feature to the tar filler is that in the summer heat it melts and flows from the joints to the gutters, and there remains, making the pavement rough and hard to clean; and in the winter it becomes brittle, is chipped out of the joints by the horses' shoes, is ground into dust, and swept or blown away. In both instances the crevices are filled with droppings and dirt which are very inferior to sand as a filler.

"Another filler, little used in the Middle West until within the last year, which merits the attention of every city engineer, every property owner whose street is about to be paved, and every brick maker, is manufactured from genuine asphalt by the American Asphaltum & Rubber Co. The requirements this product shall meet, as given out by this Company, are as follows: 'The asphalt shall not be less than 99.5 per cent. pure bitumen composed of not less than 68.3 per cent. petrolene, and 31.2 per cent asphaltene (each having a specific gravity of not less than 0.90 and 1.13 respectively). The specific gravity of the compound shall not be less than 0.99. It shall not be 'tacky' after an exposure of five hours to a temperature of 125° F. The melting point shall not be less than 210° F., and by capillary tube tests it shall not commence to melt below 195° F., and shall not run below 215° F. The filler shall remain ductile at all ordinary temperatures, and shall not be affected by the moisture.

"The advantages of this asphalt filler are: 1, It keeps the brick in proper position. 2, It thoroughly protects the corners and edges of the brick. 3, It cannot be washed or swept out of the joints. 4, Water cannot penetrate it and reach the foundation. 5, It is thoroughly sanitary. 6, It adds about half as much strength to the pavement as the ordinary concrete foundation. 7, It does not run in summer, or become brittle in winter, and cannot be ground into dust, and at all times it remains flush with the surface of the brick, and prevents the wheels of the passing vehicles from jolting and rattling over the joints with a rumble and a roar. 8, It takes care of the expansion of the brick, and there is no rumbling sound. 9, Openings in the pavement can be more easily made and repaired than where a cement grout filler is used, and the

asphalt can be removed from the brick with but little difficulty, be heated and used again in making repairs. 10, The pavement may be thrown open to traffic immediately after pouring the joints. On some streets the inconvenience caused by having the street blockaded for a week or ten days longer would amount to more than the additional cost of the filler.

"At Bay City, Mich., is a pavement having the interstices filled with this asphalt. This work was completed in 1899, and on examination the asphalt seemed to have retained all of its original properties, and could be worked into a ball without crumbling to pieces. The cost of this asphalt filler is about 14 to 16 cents per square yard, which is about 12 to 14 cents more than sand, and 4 to 6 cents more than cement grout. If some expedient could be devised whereby a mixture of 1 part asphalt and 1 part sand could be poured and entirely fill the joints, excellent results could be obtained, and the cost would be very considerably reduced. But the extra expense of the asphalt filler is only a small item, and when its usefulness and the comforts which it affords are considered, the money is well invested.

EXPANSION JOINTS

"Where cement grout filler is used, some expedient should be used to prevent the expansion, caused by the rise of temperature, from heaving the pavement or breaking off the curb where the sidewalks extend out to it. The rumbling noise, so common with this filler, has been attributed to this temperature expansion. However, in instances where the pavements are provided with tar expansion joints, the rumbling is still present, and right at the joints. From this we must conclude that the rumbling is from some other cause or the material used in the expansion joints does not possess sufficient elasticity. It has been the common practice to use No. 4, No. 5, or No. 6 coal tar distillate in the expansion joints. The asphalt filler already described has been used for expansion joints and with very excellent results.

WOOD BLOCK PAVEMENTS

"Wood pavements, (not the round cedar block), seem to be growing somewhat in favor. The wearing surface is laid of rectangular wooden blocks, 3, 3½ or 4 ins. in depth, and set on end. The process of preparing the material consists of sawing the lumber into blocks, and after careful inspection they are placed loosely in iron cages which are run into a large steel cylinder which is hermetically sealed. The blocks are gradually heated to a point where the moisture in the wood is transformed into vapor and removed by vacuum pumps. Kreodone oil or similar preservative is then admitted into the tank, and forced into the fibers of the wood under a pressure of 70 lbs. per sq. in., until each cubic foot has absorbed from 10 to 12 lbs. of the oil.

"The construction of wood block pavements is very similar to that of brick, and the interstices between the block should be filled with sand, cement grout, or preferably, the asphaltic filler. When sand or cement grout is used as the filler, asphaltum expansion joints should be

provided to prevent the pavement from heaving or rumbling. The advantages of this form of pavement are: 1, It is easily cleaned, maintained and repaired. 2, It is comparatively noiseless. 3, It is thoroughly sanitary. 4, It is durable.

"A good example of this pavement may be seen on Michigan avenue, Chicago, in front of the Auditorium Hotel, and also on the Rush Street bridge. The blocks in these two instances were laid in June, 1900, have been in about five years, and have stood up well under the traffic. This is more than can be said of some of the pavements that have been laid in this city since that time. The cost of wood block pavements laid on a good concrete foundation is between 60 cents and \$1.25 more per square yard than brick pavements, depending upon the depth of the surface block, and the location of the pavement. While it is more expensive than brick, the additional expenditure is for a luxury for which some property owners are willing to pay."

Brick Paving Methods

THE *Good Roads Magazine* for February devotes several pages to the discussion of brick paving methods, tracing the history of this pavement, so far as the United States is concerned, to Charleston, W. Va., where brick laid in 1870 were found, twenty years later, to have worn less than half-an-inch, the material used being ordinary hard-burned building brick—a very different article from that now available to road builders throughout the country.

The article quotes the opinion of the New York State authorities that the advisability of the use of brick on country roads should be considered in the following cases:

"First. On those roads where the traffic is heavy enough to wear away a macadam surface at the rate of one inch per year or more.

"Second. On those roads where it is impossible to keep a macadam surface free from ruts, holes or depressions by means of heavy traffic or narrow tires.

"Third. On those roads where the cost of constructing and maintaining a macadam surface is excessive by reason of the long haul for broken stone. Where it is necessary to pay out a large sum of money for freight charges on broken stone, it may be advisable to pay out this money on the same tonnage of paving brick, which will last longer and cost less for repairs.

"Fourth. On those roads where the only broken stone available at a reasonable cost is not suitable to form a wearing surface for a macadam road which is to carry heavy traffic.

"When properly constructed, the cost of maintenance of a brick surface would be much less than that of a macadam or a gravel surface. It would not level out in spring or in dry weather, and would not be covered with dust or a layer of mud, as is the case on many macadam roads; also the tractive resistance would be less than on a macadam or gravel surfaced road."

An estimate is given of the cost of a brick roadway, eight feet wide, laid on a broken stone and sand founda-

tion five inches thick, with broken stone nine inches thick and two feet wide on each side, and wooden curbs, making a twelve-foot road of brick and macadam. This, it is stated, can be built for from \$11,500 to \$15,500 per mile, or, with a concrete foundation, for from \$600 to \$1,000 per mile additional.

Perhaps the most interesting feature of the article is the reply furnished by "a well-known road builder" in response to a request for information, as follows:—

"In answer to your inquiry in regard to the practice of using sand as a filler between brick in lieu of 'slushing' with neat cement and water, allow me to say that both methods are used in the laying of brick pavements; each system or practice has many strong friends. In my judgment cement slushing possesses the most practical arguments in its favor. In the laying of a brick pavement great care should be used in putting down a good concrete foundation of uniform thickness and a smooth surface of identically the same cross slope grade as has been established for the finished grade of the street. A mistake is made many times from the clamor of those having to use this pavement in putting on the other courses on top of the concrete base before the cement has had an opportunity to evaporate and solidify and dry out. The rumble which we so often hear is caused by the shrinkage of the concrete base, this shrinkage causing a void between the brick and the concrete foundation. As a remedy, an inch of asphalt is poured in between the brick and the curb so as to allow for contraction and expansion. This has furnished a remedy to a considerable extent, but not wholly.

"After the cement foundation has become bone dry an application of dry sand two inches in depth should be applied uniformly over the entire surface of the concrete, so as to make a cushion upon which to place the brick. Care should be exercised in laying the brick as nearly as it is possible so to do at right angles with the curb or centre line of the street. A template should be used at every process of the work from the subgrade to the finished surface. The brick should then be firmly bedded into the sand cushion with a roller run over the brick a sufficient number of times, so that the surface will be firm, smooth and true. All brick that have been disturbed and worked out of line should be set in place. All brick that have broken or checked in the process of rolling should be removed and perfect brick substituted. After which a good thick cream of neat cement mixed with water should be slushed on and thoroughly broomed in, so that all interstices will be filled up flush with the top of the brick. The inch piece of wood that had been put in next the curb should then be removed and hot asphalt poured into the void. All travel should be kept off until the cement has had time to thoroughly set. Then the road can be opened for public travel.

"So the essentials in laying a durable brick pavement are: First, to get the very best brick on the market, those that have stood the test of travel for a period of years; then see that all soft brick—those which have not been properly burned—are discarded. Second, see that the sub-grade is composed of material that will not heave,

yield or settle, preferably sand or gravel. Third, get good clean stone of mixed sizes, ranging from $\frac{3}{4}$ -inch to 2 inches longest diameter, and mix these stones in the proportion of five parts stone to three parts sand and one part Portland cement. The stones can either be mixed by hand or with a mixer. Fourth, see that the concrete course is put down uniformly and thoroughly rammed into place with the finished surface of the concrete smooth and true. Fifth, after the concrete has become thoroughly dry, put on a 2-inch cushion coat of sand as free from moisture as possible. Sixth, put the brick in at right angles with the curb, having first laid along the curb an edge of spruce stripping one inch in thickness. Seventh, thoroughly roll the brick after they have been laid, so as to have them present a smooth, firm and uniform grade. Eighth, straighten all lines, remove imperfect brick. Ninth, slush over the whole surface with neat cement mixed with water to the consistency of cream, thoroughly broom in. Tenth, remove the stripping next the curb, pour in asphalt. Eleventh, keep the street closed until the cement has had an opportunity to settle, then turn the street open to public travel."

The Sliding Scale for Gas

A SPECIAL committee appointed last year by Governor Douglas, of Massachusetts, to consider the proposed application of the "sliding scale" to Boston and Brookline gas companies has sent in its report or, rather, reports. The three Gas Commissioners, Messrs. Barker, Schaff and George, forming a majority of the Committee, enter into a lengthy discussion of the problem but abstain from any definite recommendations. Their colleagues, Messrs. Hall and Cotter, on the contrary, strongly commend the scale as it has operated in Great Britain and propose its adoption for the Boston Consolidated Gas Company. As is well known, the principle of the scale is that for each reduction in the price of gas the company is permitted to make a stated increase in its rate of dividend.

The minority report suggests that the standard price of gas under the proposed adoption of the scale shall be ninety cents per thousand, as at present; that the standard rate of dividend shall be seven per cent., as against a present rate of eight per cent., and that for each decrease of five cents per thousand the dividend rate may be increased one per cent. Periodical revision of this basis to be left to the Legislature, but the Board of Gas Commissioners would still hold public hearings on complaints, and the existing provisions of the anti-stock-watering acts would remain in force.

The reporters express their belief that "the partnership principle of participation in profits and losses by the companies and the consumers, upon which the sliding scale rests, has proved an inducement to the gas companies of Great Britain to manage their business prudently, skilfully and economically, resulting in more progressive and careful business methods, more judicious and economical expenditure of money, greater diligence in the profitable disposition of residuals and a safer rate of dividend to the stockholders, than any method before known

in connection with the gas business in that country, and that it has surpassed all others in establishing respect and confidence between the companies and their consumers and employees in London." The growth of the London companies since the adoption of the scale has, they say, been unprecedented, as evidenced by the increase in sales of gas and number of consumers. A point not generally known is that the adoption of the scale is optional with the companies, none of which, having once come under the system, has asked to be relieved of its provisions.

Asphalt Prices and Quality

THE MUNICIPAL JOURNAL AND ENGINEER of February 7, in directing attention, on page 135, to the drop in asphalt pavement prices from \$3.50 to less than \$2.00 per square yard within the last few years, took occasion to point out that a corresponding depreciation in quality was no more than a natural concomitant to that process. Striking confirmation of this view is to be found in a special report by a committee of the New York Municipal Art Society on the pavements in Manhattan, among which asphalt streets were selected for first investigation. The decline of prices is shown by the fact that the average price paid in 1897 was \$3.18 per square yard, rising to \$3.69 in 1900 and falling to \$1.55 in 1902, \$1.92 in 1903, and \$2.13 in 1904 and 1905. The Committee points out that what might at first be regarded, from the taxpayers' standpoint, as a beneficial reduction of cost is by no means deserving of that description. The term of maintenance has dwindled from fifteen years in 1897-1900 to five years in 1902-1905, with the result of poorly laid pavements and loss to the city.

But this is not the full measure of the situation. "Whereas the old specifications called for a concrete base of from six to eight inches, the contractor is allowed to cut it down to four and five inches. In many instances where pavements have been actually measured, the contractor has been found to give short measure. What is known as the binder course, which is laid on top of the concrete base, is not as thick, nor is as good material used as formerly. The top or wearing surface has also been slighted, so that the city has not received the full measure called for by the specifications."

As regards the chemical and physical properties of various asphalts, as revealed by analysis and use, Prof. A. W. Dow, of Washington, is quoted as stating that no Bermudez asphalt surface laid in that city has ever "rotted," even in the gutters. Trinidad pitch surfaces, were found in great variety, from very good to very bad, by the chemist acting for the Committee, who follows Prof. Dow in advocating "the use of natural bitumens and nothing else." Incidentally, the Committee states that the asphalt pavements alone, in the borough of Manhattan, have cost the city about \$16,000,000.

A DEFICIT OF \$248,000 is shown by the accounts covering the first nine months' operation of the London County Council's Thames steamboats.

Brick Pavements at Fort Smith, Ark.

MAYOR BARRY, of Dallas, Tex., who is interested in pavements for his city, has been furnished, by City Engineer T. R. Bayley, of Fort Smith, with some interesting data as to the cost and durability of vitrified brick paving in the latter city. Garrison avenue was paved with brick from a local plant in 1888. A 6-inch concrete base, 3-inch sand cushion and sand filler were used, the cost being \$1.86 per square yard. In North Sixth street, paved in 1890, with similar brick, two courses were used on sand foundation, one flat, the other on edge, with sand filler, the contract being let at \$1.35 per square yard. A third type of construction, omitting the flat course of bricks, was adopted in 1890 for North Eleventh street, and cost \$1.25 per square yard.

On Garrison avenue, where there is very heavy traffic, the brick began to give way about eight years ago, *i. e.*, about ten years after being laid, and had to be replaced in some places. Other streets would be in good condition to-day but for "bad repairs made by plumbers." Mr. Bayley states, as the result of his experience, that "with a solid earth foundation, for strictly residence streets, a single brick pavement is very satisfactory."

An Elastic Filler

THE accompanying illustration, for which we are indebted to The American Asphaltum and Rubber Company, Woman's Temple, Chicago, shows the method adopted in applying the "Pioneer" asphalt filler with which the Company's name is prominently identified. Without entering into the controversy which has long been waged between the respective advocates of a rigid filler, like Portland cement, and a slightly yielding medium, it may at least be said that the asphalt filler now referred to represents the most modern ideas in the latter category.

As outlined by the Company, the material used for fill-

ing the joints of brick pavements should be not less than 99.5 per cent. pure asphaltic bitumen, composed of about 68.3 per cent. petroleum and 31.2 per cent. asphaltene, having a specific gravity of not less than 0.90 and 1.13 respectively. The specific gravity of the filler compound is recommended to be not less than .99 with a melting point of not less than 210° F. It should weigh not less than 7½ lbs. and not more than 8 pounds to the gallon and yield about 250 gallons to the ton. The manufacturers furnish exact instructions as to the melting and pouring of the filler, but the general method is clearly shown by our illustration. The long-handled can used for pouring is fitted with a removable spout and a rod for regulating the flow of the material.

Street Cleaning by Pressure Machines

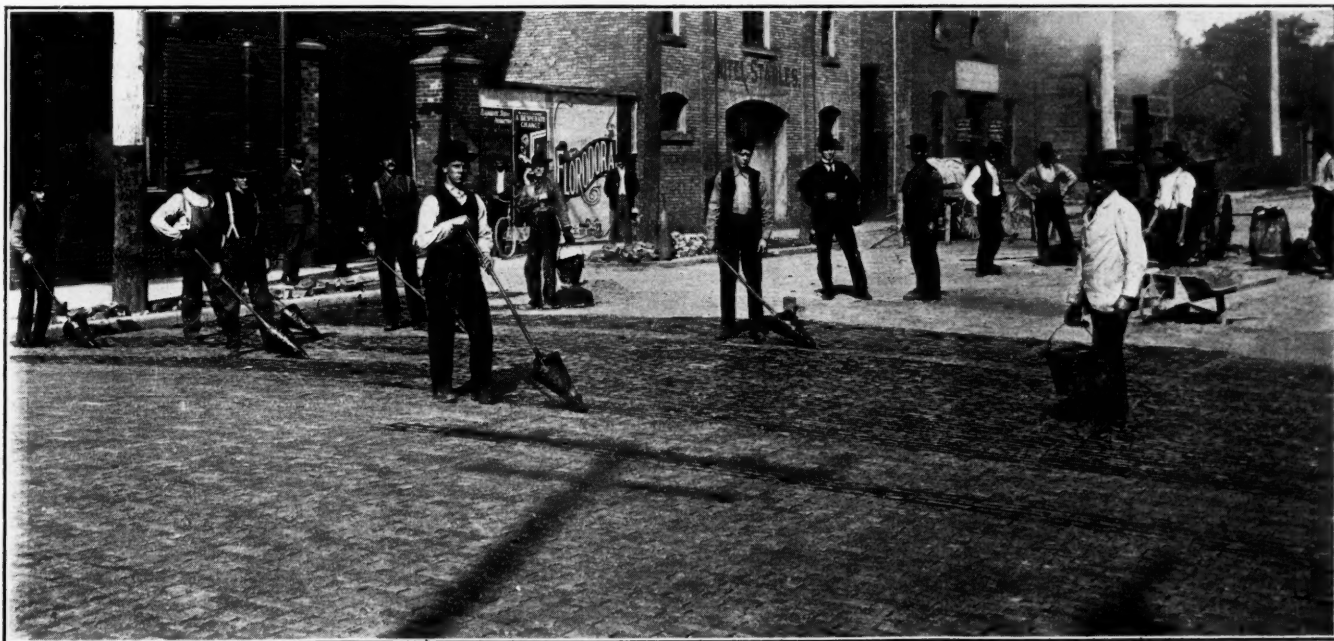
FURTHER referring to the use of pressure machines for street cleaning, two instances of which were cited on page 52 of THE MUNICIPAL JOURNAL AND ENGINEER of January 10, the following communication refers to at least one feature not within the scope of previous records:

EAST ST. LOUIS, ILL., February 13, 1906.

The Editor, MUNICIPAL JOURNAL AND ENGINEER:

Our experience in cleaning streets by means of pressure flushing machines is similar to that in other cities. They are all right for an occasional washing, to take off the mud, but on brick streets (ours are all brick) their action cuts out the filler too much. On asphalt streets they should give very good service. We work two machines together, one filling while the other is washing. A private company owns the waterworks, and the city pays for the water at the rate of 5 cents per thousand gallons. In sweeping the streets we use one of the machines to sprinkle in advance. One trip will cover the full width of a sixty-foot street.

Yours truly,
W. A. THOMPSON,
First Asst. City Engineer.



AN ELASTIC FILLER.—POURING "PIONEER" FILLER INTO BRICK PAVING JOINTS

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It is also desired that the facilities furnished by the reference library in this office should be widely known and freely used by those interested in municipal affairs. Visitors will be welcomed and provided with conveniences for search, and inquiries by mail will be promptly dealt with.

NEW YORK, FEBRUARY 21, 1906

Chicago Street Traction

THE situation arising out of Mayor Dunne's continued refusal to publish Mr. James Dalrymple's report is rapidly assuming a character which will render such publication by far the lesser of the two evils with which the Mayor is confronted. Failing to secure access to that document, the City Council passed a resolution asking the Glasgow Council, whose official Mr. Dalrymple is, to furnish it with a copy. What has since transpired is more or less doubtful, but it has been stated that the Glasgow body considers the report public property and, as such, would publish it in Glasgow if Chicago were not placed in possession of it. As against this, the Mayor urges that the report is his private property, mainly on the ground that, at the time he consulted Mr. Dalrymple, the former, though elected, had not yet assumed the dignity of the mayoral chair.

Now comes the cabled report of an interview with Mr. Dalrymple, in Glasgow, according to which he characterizes the proposals made by the Chicago traction companies as fair and reasonable, by which it is supposed he refers to those made to the city within the last few weeks, long subsequent to the date of his much-discussed report. He is said to have stated that the existing plant is worn out, and that the companies, under existing conditions, have no inducement to spend money in its improvement, owing to their uncertain position. As regards the proposed bonding of the city for \$75,000,000, a matter which is to come before the people in April, he is said to regard even that heavy outlay on a municipal system as being only a starter, as enormous sums would have to be spent to bring the lines up to a state of efficiency.

Assuming the above to be a trustworthy statement of the expert's views, there is the more reason for giving weight to them because they deal with matters peculiarly within his province, leaving the question of Chicago's fitness, or otherwise, for the assumption of civic responsi-

bilities in this connection to be dealt with by those whose knowledge of the local and national conditions better entitles them to a hearing. But we cannot help thinking that the air would be cleared of much undesirable gossip and vague assertion if Mayor Dunne were to take the world into his confidence by frankly making Mr. Dalrymple's report as public as he is asked to do. The rest of America is looking to Chicago for guidance on a very debatable subject and it is not in any unreasonable spirit that enlightenment is asked from its Chief Magistrate at such a time.

Principles of Water Softening*

THE chemical treatment of water dates back to antiquity. Certain chemicals were even used by the Chinese and Egyptians. Chemical treatment of water for the removal of hardening constituents began about the middle of the last century with Clark's suggestion for using lime to remove lime and Parter's suggestion to use soda ash to remove the incrusting constituents. Nothing better than the use of these two chemicals has been suggested since that time, but the methods of using them have been vastly improved, both in the character of the apparatus used and in the method of operation.

The object of the application of lime is to neutralize the effects of the free and half-bound carbonic acid, precipitating calcium carbonate and magnesium hydrate. The object of the soda is to convert the sulphates, chlorides, etc., into carbonates, so that they may be precipitated by lime as above mentioned.

The following figures show the quantity of chemicals required for the various constituents of hard water. For each part per million of the substances mentioned in the first column it is necessary to add as many pounds per million gallons of lime and soda as are given in the second and third columns.

Parts per Million of	Chemicals required in pounds per million gallons.	
	Lime.	Soda.
Free CO ₂ ,	10.62	0
Free acid (calculated at H ₂ SO ₄)....	4.77	9.03
Alkalinity	4.67	0
Incrustants	0.00	8.85
Magnesium	19.48	0

The above figures do not take into account any impurities in the chemicals. These have to be considered, however, in actual operation. If one knows the character of the water, it is possible to calculate with close precision the amount of chemicals required. Often, however, the untreated water varies in quality to such an extent that it is necessary to make frequent changes in the amount of chemicals required. It is possible, by making continual analyses of the raw water, to observe these changes and vary the amount of chemicals accordingly. It is easier and better, however, to study the character of the treated

* Abstract of the fifth in a series of six lectures on "The Industrial Uses of Water," given, on Tuesday evenings, before the Polytechnic Institute of Brooklyn, by Consulting Professor George C. Whipple, of the Department of Chemistry.—Lecture of February 6.

water and to determine from its analysis how the chemical feeds should be changed. By means of three simple tests this can be done. Determinations of the total hardness, alkalinity and causticity furnish the necessary data, and these may be obtained by simple tests which the engineer in charge can make. The ideally treated water should be one in which the causticity is about one-half the alkalinity and in which the alkalinity and total hardness are the same. It is possible to reduce the hardness of almost any hard water to about 50 or 60 parts per million.

Rapid Transit in New York

A SHARP conflict of opinion has been evoked by a bill now before the Cities Committee of the New York State Senate, known as the Elsberg Rapid Transit Bill, which proposes to regulate the future provision of passenger transportation facilities in New York City. One view, held by Mr. William M. Ivins among others, is to the effect that the Rapid Transit Commission should be compelled, by the new law, to make separate contracts for construction and operation, and that no contract for operation should be entered into until the substantial completion of the road. This is a radical departure from the system, whose retention is urged by others, under which the existing subway was built, the work of construction and operation being let as parts of one contract under the provisions of the enabling act.

The City Club of New York, in a letter addressed to the Senate Committee, defines its position as occupying middle ground between these two extremes, believing that the Transit Commission should be empowered to let these contracts either separately or jointly, as it may deem best for the city's interests. The letter goes on to state that the intention and effect of a mandatory provision for joint contracts alone would be to compel the municipal operation of all new subways—a step which should not be made possible by any process of indirection. The Club believes that, if this be the intention of those holding that view, they should at least so amend the bill as to make this perfectly plain to the community.

A substitute bill offered by the City Club is so framed as to leave the Transit Commission a free hand in this respect and embodies, further, the important principle that the term of future subway contracts, instead of being a maximum of fifty years, should in all cases terminate at a date not later than the extent of the present contract, viz., October 27, 1954.

A Wisconsin Mayor for Municipalization

MAYOR O'HARE of Superior, Wis., well known as an advocate of municipal ownership, has placed his views on this subject, with special reference to that city, before the City Council in a lengthy communication, from which we extract the following:—

"When I was first elected Mayor, I ran on a platform containing a plank favoring the municipal ownership of all public utilities, and promised to aid in the adoption of that principle as soon and whenever practicable.

"In my opinion that time has now arrived, for reasons

hereinafter set forth, and I hope to receive the support and co-operation of every alderman and of the citizens generally to the end that the people may own these public utilities and thereby reduce the cost of living. In order to build up our city it is absolutely necessary to make our living expenses as low as possible, and the public ownership of lighting plants, water plants and street car systems is an important step in that direction. While it is the duty of the Common Council to look after the finances of the city, the streets, sidewalks, sewers and other details of city government, it is just as much your duty to provide good water and light and comfortable transportation facilities to our citizens, and at the lowest possible cost, and there are several reasons why I believe this is the proper time to take the necessary steps for the city to secure the ownership of some of these public utilities. . .

"At this time I do not intend to enter into any extended discussion as to the merits of municipal ownership, but it seems reasonable to believe that our citizens can get better and cheaper accommodations by owning their own municipal plants, if they purchase them at actual values. It is a well-known fact that all, or nearly all, of the corporations furnishing cities with water, light or transportation pay for the construction of their plants by the issue of bonds, a large portion of the proceeds of which never goes into the plant at all. In addition, great amounts of stock are issued by the promoters which are all water, and then the patrons are obliged to pay interest on these, sometimes to the amount of several times the actual cash that went into the plant, and also on the watered stock. These facts can be substantiated without very much trouble.

"Again, it is said that a private corporation can operate a plant much cheaper than a municipality, but nevertheless in this country we have a very large number of municipal plants that have been furnishing water to the people at lower rates than any corporation ever furnished it and have even then made enormous profits. We need only look into the history of the municipal water plant at Milwaukee to be convinced of this, for at the last meeting of our State Legislature the Milwaukee people procured special legislation to enable them to dispose of some of their accumulated profit. In Great Britain municipal ownership was a settled question years ago, and it has brought about such an enormous reduction of rates that no one, even the most conservative, would favor a return to old conditions and allow corporations to furnish them water, light and transportation."

THE EFFECT OF ARMORED MOTOR TIRES on roads was discussed, January 31, by the Association of County Engineers of New Jersey. The meeting was unanimous as to the injury done to improved roads by armored and chain tires, and endorsed section 8 of Senator Frelinghuysen's bill for the regulation of automobiles. The section is as follows: "No motor vehicle tire shall be fitted with a chain or other metal grip device when used upon macadam or other roads, except upon asphalt, cobble, Belgian or brick pavements."

The Water Supply of Buffalo

OWING to the necessity of installing additional pumping engines to keep pace with the enormous use—and waste—of water in Buffalo, N. Y., it was proposed to follow in the steps of the industrial companies now utilizing the power of the Niagara Falls by operating electrical pumps from that source. While the proposition has been disapproved by the expert Commission to which it was referred, it is of interest to note certain features of the report, bearing upon the admittedly abnormal consumption prevailing in that city. The Commissioners, it should be stated, were Col. Thomas W. Symons, U. S. A., Gen. George S. Field and Mr. Rudolph Hering, the well known sanitary and hydraulic specialist.

They state that the average per capita consumption per day was 319 gallons in 1903-04 and 336 gallons in 1904-05 and characterize this reported figure as being greater than that in any other city in the world. While believing that the amount is really in excess of the volume actually pumped, they proceed to discuss the undoubted waste prevailing among the people and institutions of the city. Even allowing for the possibility that the proper allowance for "slip" in the pump plunger displacement should be 20 per cent., instead of the 10 per cent. on which the reported figure was based, they are still faced with a daily per capita consumption of 300 gallons in 1904-05, and express the opinion that "the people of Buffalo have no use whatever for a large part of the water pumped, and which is wasted without doing good to anybody." Leaks are known to exist in mains, but the greater part of the waste is due to the habit of allowing water to run freely from spigots "much of the time," while leaky and broken fixtures are common. In some sections of the city defective fixtures represented 90 per cent. of the whole. Thus, the waste and leak gang of the Water Department found in the district covered by its operations "1,391 service pipe leaks, 10,123 leaking fixtures and water closets, 582 water closets connected with the water supply without proper controlling fixtures, and 318 whole supplies running all the time without any controlling fixtures whatever." Repairs made in this district brought about an estimated saving of over 4,000,000 gallons per day.

The report urges the necessity of continued activity on these lines, together with the adoption and enforcement of more stringent regulations in regard to the character of fixtures, with penalties for their non-observance and for permitting the continuance of waste. Inspectors should be "properly uniformed and armed with full authority to enter all premises."

But even these drastic changes will not, in the opinion of the Commissioners, effect more than a partial remedy for conditions as they exist to-day. "The only perfect remedy is the installation of a meter on every service, not only to limit waste in house services, but to exact equitable rates for water consumed and to aid in the detection of leaks from street mains and service pipes." The Commissioners recognize, however, the existence of a strong prejudice against meters, and therefore suggest that their

introduction should proceed gradually, so that, before long, "the good sense of the people of Buffalo will indicate clearly to them that it is the proper system to adopt for the distribution of water and collection of water rates, just as it is in the case of gas and other supplies." They recommend, in this connection, that the Water Department should make it a rule to put a meter on any service where it is felt that an excessive use or waste of water is taking place, and endorse the principle that all meters should be owned, placed and kept in repair by the Department.

A City's Accounts

CHARLESTON, S. C., has issued a leaflet in which that city's method of keeping accounts and making appropriations is concisely described. The year's expenditures are based on detailed estimate submitted to the Committee of Ways and Means by each of the departments, these being revised by that Committee. The tax rate is determined by the total then resulting, less the income derivable from other sources than taxation. The proposed tax-rate, with the itemized foundation for it, is then discussed by the Council, which makes all appropriations. The Mayor has the right of vote, but no veto power.

No cash is carried to the credit of any departmental account unless so ordered by the Council, and no account can be overdrawn unless by ordinance, the Council making additional appropriations in that case. Similarly, the order of the Committee of Ways and Means is necessary to permit of any balances being carried forward at the end of the fiscal year, all accounts being then closed. All cash is carried through the city's books, whether the city is directly interested or not, instead of running several different cash accounts.

Tax returns are made to the Assessor and debited to him pending collection.

A Novel Situation

THE city of Mishawaka, Ind., is the real defender in a suit brought by certain citizens against the members of the Common Council and others appointed by the Chief Executive to serve as directors and incorporators of the Mishawaka Public Utilities Company, a corporation formed to take over the city's waterworks and electric plants, with an ulterior object in enabling the Mayor and Council to construct an extravagantly conceived city hall. The company was created by a bill which, it is alleged, was railroaded through the Legislature, and the plaintiffs in the suit impugn its legality. It is urged that the city had no right to sell; that not one cent was received by the City Treasurer from the transaction; that the city is paying all the bills for the maintenance and operation of the two plants, besides finding the funds for extensions. The prime necessity for some such scheme arose from the city having reached its debt limit. According to local newspapers, some sensational revelations are anticipated at the hearings.

City Brevities

YOUNGSTOWN, OHIO, is discussing the general introduction of water meters.

MORRISTOWN, N. J., has formed a civic association, which held its first meeting on February 9.

NORTHAMPTON, MASS., has had a municipal theater for ten years; last year's profits were \$9.41.

WATERBURY, CONN., requires a new garbage crematory, of increased capacity to that now in use.

CORNING, N. Y., proposes to acquire the local waterworks and expend \$150,000 on its improvement.

BATAVIA, N. Y., has offers from two companies to supply electric power generated at Niagara Falls.

BISBEE, ARIZ., started its first brick paving February 7; petitions for further work of this class are already being presented.

ALTOONA, PA., is agitating the expenditure of \$300,000 on paving, of which one-third would be contributed by the city and two-thirds by property owners.

LONG BRANCH, N. J., has before it a proposition to collect and dispose of "garbage, paper, ashes and house waste" at twelve cents per week per house.

NEW YORK CITY proposes to adopt the rule, followed by the Federal government, of prohibiting advances in official salaries excepting in October, when the budget is being made up.

BORDENTOWN, N. J., is to investigate the alleged excessive expenditure in the construction of its new waterworks. A total of \$150,000, as against an estimate of \$65,000, is figured.

ROCHESTER, N. Y., is sending the Mayor, the City Engineer and the Commissioner of Public Safety to Washington, Philadelphia and Brooklyn to inspect the Gamewell fire alarm systems in use.

ORANGE, N. J., has in view an expenditure of \$250,000 on comprehensive changes and extensions to its water undertaking, on the basis of a report by Rudolph Hering, C.E., and City Engineer Crane.

ATLANTIC CITY, N. J., has adopted an ordinance giving the Bell Telephone Company the right to lay a conduit along the entire length of Atlantic avenue, and in other streets; a duct is to be reserved for fire and police wires.

CHICAGO, ILL., has received six bids for garbage reduction over a five-year period, among them one offering to do the work for nothing, the city collecting the garbage and delivering it at works to be erected by and at the cost of the bidders.

FAIRHAVEN, MASS., well known as the birthplace of Mr. H. H. Rogers, who has spent large sums in beautifying the town, will shortly enter into possession of its new thirteen-acre park, formed by filling in an old mill pond, which formerly furnished anchorage for vessels. The work has been under way for three years, and involved about 200,000 cubic yards of excavation and refill, with conveyance of about a mile from where the earth was obtained.

Trade Notes

THE CITY HALL AT SAVANNAH, GA., has been equipped with metal furniture by the Art Metal Construction Company, of Jamestown, N. Y.

THE CROCKER-WHEELER COMPANY, of Ampere, N. J., at a recent meeting of its officers and branch managers, was able to report remarkable progress, during 1905, in the alternating current field, as also in its line of core-type transformers.

THE INCREASING USE of electrically driven centrifugal pumps, not merely for occasional use but for regular service, is one of the features of modern engineering. Ten pumps of this class have been ordered by the city of New York from the Allis-Chalmers Company, of Milwaukee, Wis., each to be capable of raising 3,000 gallons per minute against a head of 300 lbs. per sq. in.

A SMALL CATALOGUE just issued by the Wirt & Knox Manufacturing Company, 22 North Fourth street, Philadelphia, illustrates the very complete line of hose reels, racks and carts which this firm maintains in various styles and sizes, together with some patterns recently added. A copy of this catalogue, with quotations where required, will be furnished on application to the above address.

JULIAN SCHOLL & Co., 126 Liberty street, New York City, direct attention in a recent circular to the complete asphalt plants now being turned out. These comprise sand driers, melting tanks, double mixers, sand elevators, screens and bins, measuring buckets and overhead trolleys, besides engines, boilers and other general plant. A portable form of asphalt plant can be conveniently used for jobs of moderate size and taken apart on completion of the work.

THE LUDLOW VALVE MANUFACTURING COMPANY, of Troy, N. Y., displays in a recent catalogue the extensive line of waterworks specialties which has earned for this company universal recognition in the waterworks world. With a reputation as "the oldest and largest manufacturers in the world" giving exclusive attention to the manufacture of valves and hydrants, the company claims to make but one class of goods—the best that can be produced. The present catalogue will be found of special value on account of the detailed dimensions of flanges and other parts.

MUNICIPAL DESTRUCTORS FOR BUFFALO, N. Y., are recommended by Col. Ward, Commissioner of Public Works, who advises the Common Council to erect two garbage destructors on the general lines of the one now operated by a company in that city, the end in view being that the city shall perform this branch of work without the intervention of a contractor. When the present destructor was built by the company, in 1903, it was intended that two more should follow. Col. Ward estimates that the company's plant could be acquired for two-thirds of the \$46,000 spent on it.

THE WEEK'S CONTRACT NEWS

RELATING TO MUNICIPAL AND PUBLIC WORK—THE CONSTRUCTION FIELD—PROPOSALS AND CONTRACTS—
SEWERAGE AND WATER SUPPLY, STREET IMPROVEMENT AND LIGHTING—FIRE EQUIPMENT—
BUILDINGS

STREET IMPROVEMENTS

Huntsville, Ala.—The City Council has approved an issue of \$10,000 in bonds for street improvements.

Montgomery, Ala.—Proposals are asked, until March 5, for paving Mildred street with vitrified brick.—R. S. Williams, City Engineer.

Pasadena, Cal.—The City Council is considering plans for a special election to determine upon a \$50,000 bond issue for street improvements.

Belleville, Ill.—An ordinance has been approved for paving Spring, Richland and First streets; also Centerville avenue.—L. L. Harper, City Engineer.

Elgin, Ill.—Ordinances have been approved for paving two miles of streets. Brick may be used. The cost will be \$40,000.

Paxton, Ill.—An ordinance has been approved for a \$15,000 bond issue for paving Pell street.

Winamac, Ind.—Proposals will be opened, March 5, for improving six miles of Pulaski County roads.—Ellis Rees, County Auditor.

Davenport, Iowa.—It is proposed to pave Seventh street. Preliminary plans are being prepared. The improvement of Fourth street is being considered.

Joplin, Mo.—The City Engineer will prepare plans for paving several streets.

Newark, N. J.—The Board of Public Works is considering a petition for improving Watson avenue.

Oswego, N. Y.—The Department of Public Works has plans for paving East Second street, Market and West Cayugo streets.—E. A. Cooke, City Clerk.

Alliance, Ohio.—Resolutions have been approved for paving East Summit street, South Liberty, North Webb, East Patterson and South Webb streets.

Cincinnati, Ohio.—The Board of Public Service will ask the Legislature to authorize a \$1,000,000 bond issue for street improvements.—Mayor Dempsey.

Cleveland, Ohio.—It is estimated that the opening of new streets will cost \$100,000.—City Engineer Carter.

Columbus, Ohio.—Bids will be invited shortly for paving Hamilton avenue, School street and Felton avenue.

Dayton, Ohio.—Third street, Western avenue, Williams street, Broadway and several alleys will be improved.

Delaware, Ohio.—Sandusky street, and probably West Winter, Franklin and West Williams streets will be paved.

Findlay, Ohio.—Lime avenue and Shinkle street will be paved with vitrified block.—J. C. Edie, City Clerk.

Rocky River, Ohio.—Bids will be opened, March 6, for \$8,000 State street improvement bonds.

Sandusky, Ohio.—Resolutions for paving Decatur street, Monroe street, Lawrence, Jackson and Washington streets have been introduced in the City Council.

Youngstown, Ohio.—McGuthrie street, Wilson avenue, East Woodland avenue, School street, Watt street, McGutty street and Market street will be improved in the spring.

Youngstown, Ohio.—A project is being considered for a \$2,000,000 bond issue for constructing three hundred miles of macadam roads in Mahoning County. The Legislature will be asked to sanction the plan.

Cranberry, Pa.—The contract for building 20,772 feet of road in Cranberry Township, Venango County, has been awarded to J. A. Fredericks, Franklin, Pa., for \$43,239.

Loyalhanna, Pa.—The contract for constructing 11,542 feet of road in Westmoreland County has been awarded to Booth and Flinn, Pittsburg, for \$17,594.

Meadville, Pa.—Bonds for \$50,000 may shortly be issued for local improvements. Some paving will be undertaken, and sewers will be built. It is also proposed to construct waterworks.

Schuylkill, Pa.—Dawson & Davis, Devon, Pa., have the contract for building 17,500 feet of road in Chester County for \$26,480.

Springfield, Pa.—A contract has been awarded to Frederick Robinson, Meadville, Pa., for constructing 11,813 feet of road in Erie County. The estimated cost is \$11,066.

Tylersburg, Pa.—The contract for the construction of 7,491 feet of road between Leeper and Tylersburg, including a concrete bridge at station 45, has been awarded to W. H. Lyons, Harrisburg, Pa., for \$14,192.

Warminster, Pa.—The award of the contract for building 23,618 feet of road in Warminster Township, Bucks County, has been made to the Frazer Construction Company, Philadelphia, for \$38,654.

Spartanburg, S. C.—The city will expend \$10,000 on street improvements.

Chattanooga, Tenn.—The Southern Paving and Construction Company has secured the contract for paving several streets at a cost of \$7,984.

Memphis, Tenn.—The estimated cost of paving Poplar street is \$75,000. Preliminary plans have been prepared.

Sparta, Tenn.—The question of issuing \$60,000 bonds for County road improvement will be decided at an early election.

Bonham, Tex.—The question of issuing

\$150,000 Fannin County road bonds will be decided at an election to be held shortly.

Sherman, Tex.—The citizens have voted to issue \$20,000 paving bonds.

Tyler, Tex.—The Attorney General has authority to issue bonds for paving purposes.

Portsmouth, Va.—The City Council will shortly take up ordinances for paving portions of Lincoln street, North and Green streets. The improvement of Glasgow street will also be considered.

Richmond, Va.—A bill before the Legislature authorizes the Norfolk County Supervisors to issue \$200,000 in bonds for improving roads.

Suffolk, Va.—The Town Council will issue \$150,000 bonds for street and sidewalk improvements.

Seattle, Wash.—Proposals for paving with asphalt Fifteenth avenue North will be opened, March 3. The cost will be \$30,500.—C. B. Bagley, Secretary, Board of Public Works.

Seattle, Wash.—An ordinance has been approved for grading and planking Pike Place at a cost of \$21,300. Bids will shortly be asked.

La Crosse, Wis.—The property owners of Planigonis street have petitioned for brick paving.

SEWERS

Denver, Col.—Preliminary plans are being prepared for constructing a sanitary sewerage system.—Mayor Speer.

Lamar, Col.—It is reported that plans are complete for constructing sewers.

New Haven, Conn.—It is proposed to build additional sewers in the downtown district. The cost will be \$60,000.—C. W. Kelley, City Engineer.

Washington, D. C.—A new sewer will shortly be constructed in Eleventh street, Irving to Kenyon streets.

Atlanta, Ga.—The Board of Aldermen has accepted the bid of H. W. Grant for building the Orme street sewer.—Mayor Woodward.

Lewiston, Idaho.—Preliminary plans have been prepared for constructing a sewerage system.

Belleville, Ill.—Sewers will shortly be laid in Spring and Richland streets and Centerville avenue.—L. L. Harper, City Engineer; Fred J. Kern, Mayor.

Moline, Ill.—Surveys have been made and plans prepared for the construction of sewers. A total of 21,200 feet of sewers will be built.—City Engineer, Clark Anderson.

Rochelle, Ill.—Sewers will be constructed in District No. 1, the work requiring 5609 feet, 15-inch pipe, 5,744 feet, 12-inch pipe, 6,007 feet, 10-inch pipe, 37,467 feet, 8-inch pipe, to be laid complete.—George E. Stocking, Clerk, Board.

Muncie, Ind.—The Normal City Town Board is considering the building of a new sewer.

Durant, I. T.—The matter of issuing \$25,000 sewerage bonds, \$16,000 school bonds and \$9,000 extension bonds will be voted on, April 3.

Tulsa, I. T.—An election will be held, February 26, to determine the question of a \$70,000 bond issue for sewer construction.

Davenport, Iowa.—The construction of sewers is being considered in Marquette street, Union, Prairie, Locust, Pleasant, Davie and High streets. Preliminary plans for sewers in Washington, Division and Viola streets are also under consideration.

Grundy Center, Iowa.—The construction of sewers will cost approximately \$16,000.

Louisville, Ky.—The Legislature has approved the bill authorizing the city to issue \$4,000,000 in bonds for constructing sewers.—Mayor Barth.

Lansing, Mich.—Bids will be opened, February 26, for constructing the Weinmann Creek Valley sewer.

Minneapolis, Minn.—The City Council will shortly consider a petition for extending the sewer system to South Minneapolis at an estimated cost of \$2,000,000. It is proposed to ask the Legislature to authorize a bond issue.

St. Joseph, Mo.—Ordinances are before the City Council for constructing a sewer in Thirteenth street; also sewers in Twentieth street.—B. F. Buzard, President, Board of Public Works.

St. Paul, Minn.—The City Engineer will undertake the completion of the Sommerville avenue sewer.

Paterson, N. J.—It is proposed to build sewers in Pacific street, East Thirtieth street, Twenty-first avenue, Derrom avenue and Eighteenth avenue. Plans have been prepared.—Robert Dalzell, Street Commissioner.

Marcellus, N. Y.—Preliminary plans have been prepared for constructing sewers.—E. D. Smalley, Surveyor.

Norwich, N. Y.—Plans for extending the sewer system have been prepared by E. F. Musson, Engineer.

Cleveland, Ohio.—The proposed intercepting sewerage system will cost approximately \$700,000.—City Engineer Carter.

Elyria, Ohio.—Proposals will be opened, March 16, for constructing the West Side trunk sewer; estimated cost, \$15,000.—C. M. Theobald, City Engineer; R. Moriarty, Clerk, Board of Public Service.

Lancaster, Ohio.—Plans have been prepared for constructing a sewer along Fifth avenue.—John F. Wolfe, City Engineer.

Oklahoma City, Okla.—It is proposed to begin shortly the construction of storm and

sanitary sewers; estimated cost, \$250,000. The question of building material is being discussed.

Philadelphia, Pa.—Proposed sewer construction and improvements will cost approximately \$350,000. The City Council is considering preliminary plans.

Reading, Pa.—Work will shortly begin on the construction of sewers in House District No. 13.—Elmer H. Beard, City Engineer.

Lake City, S. C.—The construction of a \$20,000 sewer system is being considered.

Victoria, Tex.—The sewer system will be extended up Main street through the business section; cost, \$1,500.

Portsmouth, Va.—The Legislature will be asked for authority to issue \$110,000 in bonds for constructing sewers.

London, Ont., Canada.—The matter of building a main sewer along Dundas street, Colborne to Wellington streets, is under consideration.

WATER SUPPLY

Calico Rock, Ark.—The Town Council is considering a proposition for the construction of waterworks.

Ontario, Cal.—Plans for building a power plant for the San Antonio Water Company involve the expenditure of \$30,000.

Palo Alto, Cal.—A. M. Hunt, San Francisco, is the engineer in charge of building the municipal waterworks.

Sacramento, Cal.—The proposed construction of a \$200,000 filtration plant is under discussion.

Dublin, Ga.—It is proposed to improve the waterworks.—Arthur P. Pew, Atlanta, Engineer.

Tifton, Ga.—A site has been selected and plans prepared for the proposed waterworks; estimated cost, \$20,000.

Bloomington, Ill.—The matter of constructing a 20-inch water main is being considered; estimated cost, \$20,000.

Kewanee, Ill.—Plans for rebuilding the waterworks are being prepared.

Parkridge, Ill.—Bids will be opened, March 6, for constructing a water-power plant.—C. M. Miller, Chicago, Engineer.

Holton, Kan.—Preliminary plans for improving the waterworks are under consideration. The construction of sewers is also proposed.

Henderson, Ky.—Proposals are invited, until February 24, for approximately 7,000 feet 12-inch, 5200 feet 8-inch and 11,000 feet 6-inch cast iron pipe.—William Sieber, Superintendent, Waterworks.

Donaldsville, La.—Plans have been prepared for constructing waterworks at an estimated cost of \$31,000. Bids will shortly be asked.

Portland, Maine.—Proposals are asked, until February 26, for extending the water system at Fort Williams, Me.—Captain A. W. Yates, Quartermaster, Portland.

Brockton, Mass.—The Legislature is considering a bill for a local \$100,000 bond issue to improve the waterworks.

Pittsfield, Mass.—A bill authorizing the city to improve the water-system has been favorably reported to the Legislature.

Grosse Pointe, Mich.—Bonds for \$10,000 for improving the waterworks will shortly be issued. New mains will be laid.

Sauk Rapids, Minn.—The question of building waterworks is before the City Council.

Trenton, Mo.—An election will be held, February 27, to determine the question of issuing bonds for building waterworks. The cost will be \$80,000.—W. A. Rynerson, City Clerk.

Tobias, Neb.—A contract to build waterworks has been awarded to the National Construction Company.

Newark, N. J.—The Town Council of Kearny, N. J., will ask permission of the Legislature to issue \$60,000 in bonds for constructing municipal waterworks.—J. F. Crowell, Town Attorney.

Raleigh, N. C.—The city is considering the purchase of the waterworks of the Wake Water Company or building a new plant.—J. I. Johnson, Mayor.

Fostoria, Ohio.—Plans are being prepared for improving the waterworks.

Garrettsville, Ohio.—Bonds for \$40,000 for improving the waterworks may shortly be issued.—E. L. Davis, City Clerk.

Oregon City, Oregon.—It is proposed to lay a 10-inch water main along Third street at a cost of \$7,000.—W. H. Howell, Superintendent, Waterworks.

Edgemont, South Dakota.—A 20-year franchise to build and operate waterworks has been granted Samuel S. Thompson.

Dallas, Texas.—An ordinance appropriating \$300,000 to improve and extend the waterworks will shortly be presented to the City Council. Bonds may be issued.—R. R. Nelms, Secretary, Water Board.

Chatham, Va.—It is proposed to construct additions to the waterworks.—O. B. Yeatts, City Clerk.

Edenburg, Va.—The citizens will ask legislative authority to issue bonds for improving the waterworks.

Seattle, Wash.—New water mains will shortly be laid in Sixth avenue West by the International Contract Company; estimated cost, \$13,112.—R. H. Thomson, City Engineer.

Peterboro, Ont., Canada.—The installation of sand filters at a cost of \$80,000 has been recommended to the Water Commissioners by Allan Hazen, Engineer, New York.

Toronto, Canada.—Estimates for proposed improvements aggregate \$985,575. The waterworks will be extended and new machinery installed.

Toronto, Canada.—It is proposed to lay new water mains along Queen street, Bathurst street to Roncesvalles avenue; also along Roncesvalles avenue, Queen street to Dundas street.

Toronto, Canada.—The proposed expenditure of \$250,000 for a new 15-million gallon pumping engine at the waterworks is under consideration.

PUBLIC LIGHTING

Phoenix, Ala.—A city committee is considering preliminary plans for erecting an electric-light plant.—Warren Williams, Mayor.

Cotter, Ark.—The city may let a franchise for building an electric-light plant.

Bridgeport, Conn.—Proposals are asked, until February 24, for lighting the streets for five years from April 1, 1906.

Duquoin, Ill.—A franchise for an electric-light and power plant has been granted to T. B. Reagin and James Forester.

Reimbeck, Iowa.—The electric-light plant, which was recently destroyed by fire, will shortly be rebuilt.

Topeka, Kan.—It is proposed to improve the municipal electric-light plant. The estimated cost is \$25,000.—James F. McCabe, City Engineer.

Hopkinsville, Ky.—A franchise for an electric street railway and lighting plant has been granted to H. M. Dalton.

Medway, Mass.—The Medway Electric Light & Power Company has been granted the franchise for lighting the streets.

Marion, Mich.—A franchise has been granted Elmer E. George, for erecting an electric lighting plant.—W. Kinney, Village Clerk.

Crookston, Minn.—Proposals are asked, until March 6, for installing an electric-light plant at the County Jail.—N. A. Hof-fard, County Auditor.

Kansas City, Mo.—An ordinance is being considered for an election, March 6, to determine the question of issuing \$2,250,000 in bonds for a municipal gas plant.—E. A. Harper, City Engineer.

Tecumseh, Neb.—An electric-light plant may shortly be erected at Sterling, Neb.

Columbus, Ohio.—An ordinance has been approved for a bond issue for additions to the electric-light plant.

Massillon, Ohio.—The Board of Public Service will shortly ask bids for lighting the streets with gas, electricity or gasoline.—Harold Howald, City Engineer.

Chambersburg, Pa.—A new power house, to cost \$135,000, will shortly be erected by the Cumberland Railroad Company.

Huntington, Pa.—The Town Council has

awarded the contract for city lighting for six years to the Huntington Gas Company.

Pittsburg, Pa.—A franchise has been granted the South Side Electric Manufacturing Company to extend its lines.—Edward M. Bigelow, Director of Public Works.

Wagner, S. D.—An electric-light plant will be constructed. John Abasher is interested.

Lafollette, Tenn.—It is reported that the contract for building the proposed electric-light plant has been awarded to local Water Works, Electric and Telephone Company.

Giddings, Texas.—Preliminary plans have been completed by private parties for constructing an electric-light plant at Giddings.

Burlington, Vt.—The Board of Aldermen has appropriated \$25,000 for improving the electric-light plant.—Frank O. Sinclair, City Engineer.

Montpelier, Vt.—The plant of the Consolidated Lighting Company will shortly be improved at a cost of \$100,000.—Lewis Lawrence, Chief Engineer.

Winchester, Va.—It is reported that the Winchester and Washington Railway Company have secured preliminary plans and surveys for constructing an electric power-house on the Shenandoah, near Winchester.

Spokane, Wash.—A franchise to erect and maintain a gas plant has been awarded to William F. Keyle.

Milwaukee, Wis.—The Common Council has approved the ordinance appropriating \$150,000 for the erection of a municipal electric-light plant.—Mayor Rose.

FIRE DEPARTMENT SUPPLIES

Hartford, Conn.—The Fire Commissioners will purchase a new truck and other apparatus.

Indianapolis, Ind.—A new fire engine will shortly be purchased; estimated cost, \$5,000.

Lansing, Mich.—It is proposed to purchase two new fire engines.

Lancaster, Minn.—It is proposed to organize a fire company. Equipment may be purchased.—L. H. Boyd, Secretary.

Virginia, Minn.—A new fire hall will shortly be erected. Plans are being prepared.

Kansas City, Mo.—A site has been pur-

chased at Fourteenth and Liberty streets for the new West Bottoms fire station.

Nutley, N. J.—The Town Council is considering an ordinance for a Fire Department.

Rochester, N. Y.—A new fire engine may shortly be purchased for the Central Avenue District.—Mayor Cutler; Chief Little, Fire Department.

Webster, N. Y.—The City Council is considering the problem of fire protection.—J. J. O'Dell, Chairman, City Committee.

Ellensburg, Wash.—A fire alarm system will shortly be installed.

PUBLIC BUILDINGS

Mobile, Ala.—The plans of Rudolph Benz & Sons for the new Mobile County jail have been approved by the Board of Revenue Commissioners. Bids will shortly be asked.

Fresno, Cal.—Proposals are asked, until March 26, for a new Federal building, including Post Office.—J. Knox Taylor, Supervising Architect, Treasury Department, Washington, D. C.

Oakland, Cal.—The Alameda County Supervisors are considering plans for a new \$150,000 Jail.

Pasadena, Cal.—Plans have been prepared for new schools.

Sacramento, Cal.—The Board of Education will shortly ask bids for a new High School. Architects have been asked to submit plans for a \$150,000 building.

Pensacola, Fla.—The Building Committee, City Council, has appointed Frederick Ausfeld as Architect of the new \$75,000 City Hall.—Charles H. Bliss, Mayor.

Athens, Ga.—Preliminary plans have been prepared for the erection of a new school building on Childs street.—John Mell, President, Board of Education.

Abilene, Kan.—Bonds will shortly be issued for the erection of a High School; estimated cost, \$35,000.

Atwood, Kan.—The plans for the new Courthouse at Atwood will be prepared by the Eisentraut-Colby Company, Architects, Sioux City, Iowa. The building will cost \$50,000.

Granite City, Ill.—The citizens have voted to issue \$30,000 in bonds for erecting a school house.

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OREGON, ILLINOIS

Portland, Me.—The Cumberland County Commissioners will open bids, March 1, for the proposed new County building; estimated cost, \$250,000.—George Burnham, Architect.

Lynn, Mass.—The City Council is considering the proposed erection of a new fourteen-room school building in West Lynn.

South Framingham, Mass.—The building of a new \$80,000 High School is being considered. Preliminary plans have been prepared.

Cadillac, Mich.—The Wexford County Supervisors are considering plans for a \$50,000 addition to the Courthouse.

Detroit, Mich.—The matter of building a new 15-room school house in the north-east city district is being discussed.

Duluth, Minn.—A commission has been appointed to direct the work of erecting the new \$100,000 Courthouse.—E. K. Coe, City Engineer; O. Holden, County Auditor.

Willmar, Minn.—A new \$25,000 High School will be erected in the spring. The School Board has plans.

Dover, N. H.—The cost of the proposed new Federal building, to include the Post Office, is estimated at \$100,000. Congress is considering a bill appropriating funds.

Atlantic City, N. J.—The Board of Education is considering plans for a new school building, to cost \$50,000. A site has been chosen on North Indiana avenue.

Cortland, N. Y.—The Legislature will shortly be asked to authorize the construction of a County Building, to cost \$200,000.

Bridgeport, Ohio.—Proposals will be received, March 1, for constructing the Heinlein Building.—James Lindsay, Architect.

Cleveland, Ohio.—Preliminary plans are being prepared for building two new High Schools.—Superintendent Brooks, Board of Education.

Columbus, Ohio.—Congress will be asked to appropriate \$500,000 for erecting a new Post Office.

Olympia, Wash.—An election will be held, March 3, to determine upon a proposed bond issue for schools.

Tacoma, Wash.—Preliminary plans are ready for the proposed new brick school building at Washington and North Twenty-sixth streets; estimated cost, \$25,296.

Elm Grove, West Va.—The Ohio County Commissioners will issue \$9,000 in bonds for constructing the Edgington Lane School building.

Madison, Wis.—An architectural compe-

tition is being arranged for plans for a new State Capitol, to cost \$4,500,000.

Stevens Point, Wis.—An election will shortly be held to decide the question of a \$20,000 bond issue for a new school building.

Tomahawk, Wis.—It is proposed to hold an election to authorize a \$40,000 bond issue for a new school building.

Cobourg, Ont., Canada.—A new Jail and House of Refuge are to be built for the counties of Northumberland and Durham.—Col. McLean, Warden.

Winnipeg, Man., Canada.—A new Police Station will shortly be erected at a cost of \$100,000.—Thomas Sharpe, Mayor.

MISCELLANEOUS

Birmingham, Ala.—The Jefferson County Revenue Board will shortly ask bids for erecting several bridges.

New Decatur, Ala.—An election will shortly be held to authorize a \$100,000 bond issue for public improvements.

Ocean Park, Cal.—Bids will shortly be asked for erecting the proposed garbage disposal plant; estimated cost, \$10,000.

Washington, D. C.—The cost of proposed improvements and alterations at the Soldiers' Home is estimated at \$1,250,000. A new mess hall will cost \$900,000 and a central power plant about \$200,000. Bids will shortly be asked.

Leavenworth, Kan.—Proposals will be received, until March 5, for building the Nine Mile Creek bridge, a new bridge in Stranger Township, and the Fall Creek bridge, Alexandria Township.—J. W. Neihaus, County Clerk.

Lexington, Ky.—The contract for erecting the garbage crematory has been awarded to the Dixon Crematory Company, of Toledo, Ohio, from amongst a large number of bidders. Capacity, 50 tons per day.

Chicago, Ill.—Bids will be received, April 4, for furnishing transmission line poles along the right of way of the Sanitary District of Chicago.—Robert R. McCormick, President, Board of Trustees.

Chicago, Ill.—City Engineer Ericson has been directed to prepare estimates of the cost of building a bridge and approaches at La Salle street and blowing up the tunnel.

Collinsville, Ill.—The matter of constructing a bridge over Bullock Creek is before the Town Council.

Fort Sheridan, Ill.—Bids are invited by the Constructing Quartermaster for remodeling the ventilating system in the guard house.

New Orleans, La.—Plans have been prepared for building a new power house at the Naval Station, New Orleans. The cost will approximate \$30,000.—Mordecai T. Endicott, Chief, Bureau of Yards and Docks, Navy Department, Washington, D. C.

Shreveport, La.—Preliminary plans have been prepared for the proposed Red River bridge.—Andrew Querbes, Mayor; N. F. Dorth, City Engineer.

Grand Rapids, Mich.—Proposals will be asked, about May 1, for building a power plant on the Manistee River for the Michigan Hydraulic Power Company. The cost will be \$80,000.—H. Von Schon, Detroit, Engineer.

Pontiac, Mich.—Bids will be asked, April 1, for constructing a power plant for the Clinton River Power Company.

Loup City, Neb.—Proposals are asked, until March 6, for constructing all bridges required in Sherman County during 1906.—C. F. Beushausen, County Clerk.

New York, N. Y.—The Board of Aldermen has appropriated \$115,000 for constructing a bridge over Mosholu Parkway, Borough of the Bronx.

Harrison, N. C.—The Moore County Commissioners will shortly ask bids for constructing a bridge over Deep river.

New Rockford, N. D.—Proposals will be opened, March 6, for constructing a steel bridge over Sheyenne river, in Eddy County.—W. C. Schwoebel, County Auditor.

Cincinnati, Ohio.—Proposals are asked, until February 23, for installing three direct connected electric generating units.—E. C. Prior, Clerk, Waterworks Commissioners.

Dayton, Ohio.—It is proposed to sell \$8,000 in bonds for constructing walls of the Washington street bridge.

West Chester, Pa.—A site has been purchased for the erection of a municipal garbage disposal plant.

Carthage, Tenn.—Proposals will shortly be asked for building a steel bridge over the Cumberland river; estimated cost, \$50,000.—L. A. Ligon, Mayor; W. M. Johnson, County Clerk.

AGENTS WANTED

to solicit contracts for a street or road pavement possessing many advantages over present roads. New in this country, but successfully laid in Europe for the last thirty years. Address "Municipal," care of MUNICIPAL JOURNAL AND ENGINEER, New York.

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Proposals

Notice of Reception of Proposals for Pavement, Etc., in the Village of Cobleskill, N. Y.

COBLESKILL, N. Y., Feb. 9th, 1906.
Notice is hereby given that sealed proposals for paving Division street and a portion of Main street in the Village of Cobleskill, N. Y., with Vitified Brick, and portions of or all the following named streets, to-wit: Main, Rose, Elm, Washington Avenue, Park, Union, Prospect, Chapel, Lark, High, Spring, North, East, Grove, South Grand, Center and Florence streets, with macadam. Also, for surface water sewers on certain of said streets. Proposals will be received by the Board of Trustees of the Village of Cobleskill, N. Y., until one o'clock P. M., March 19th, 1906, at which time at the Trustees rooms, in said Village, they will be publicly opened.

Proposals will be received for paving in accordance with the duly adopted specifications, contract, and form of proposal which may be obtained of the undersigned upon application. Plans and maps may be examined at the office of the undersigned. Bids should be made on the form of proposal adopted, and may be delivered to the undersigned or to any of the Board of Trustees at the time and place fixed for opening the same.

The right to reject any or all bids is hereby reserved.

WILLIAM H. GOLDING,
Clerk of the Village of Cobleskill.

Bids for Paving

Sealed bids will be received by the City Clerk of Ann Arbor, Mich., until 7:30 o'clock P. M., February 28th, 1906, for laying 9,300 square yards of paving. Bids are asked for paving with Brick, Creodone Block or Warren's Bitulithic Pavement. Plans and specifications are on file in the City Engineer's office. A certified check of \$1,000, made payable to the order of the City Clerk, must accompany each bid.

Order of Board of Public Works.
ROSS GRANGER, Clerk.

Paving

AUGUSTA, GA., February 10, 1906.
Sealed proposals addressed to the "City Council of Augusta, Ga.," will be received by the Street Committee until 12 o'clock, noon, Thursday, March 1, 1906, for furnishing material and labor and paving 5th street, from Broad to Bay streets; Bay street, from 5th street to East end of City Wharf; 7th street, from Broad to Reynolds streets; 7th street, from Ellis to Walker streets; 9th street, from Broad to Bay streets; Reynolds street, from 7th to 9th streets with either Brick or Small Belgian Block. The surface to be covered is approximately twenty-three thousand (23,000) square yards, and the material to be used will be selected by the City after the bids are opened.

Specifications can be had by applying to this office on and after February 15th.

A certified check for \$500 must be deposited with each proposal.

The City Council of Augusta reserves the right to reject any or all bids.

NISBET WINGFIELD,
City Engineer and Commissioner Public Works.

Paving

The City of Lake Charles, La., solicits bids on 26,000 yards of paving according to plans and specifications to be on file in the office of Frank Shutts, City Engineer, on Feb. 24, 1906. Bids must include all necessary earth work and drainage pipe installation and must be on file in the office of the City Clerk not later than 8 o'clock P. M., March 20, 1906.

C. H. WINTERHALER, Mayor.

Water Works Bonds

Sealed bids will be received by the Board of Improvement at Osceola, Ark., until ten o'clock A. M., March 3, 1906, for \$34,000.00 worth of 5 per cent. 20-year water-works bonds.

The Board of Improvement reserves the right to reject any and all bids.

Address BOARD OF IMPROVEMENT,
Osceola, Ark.

Sewers

NOTICE TO CONTRACTORS.

Sealed proposals for the construction of about twenty thousand feet of sewer (20,000 ft.) will be received by the Board of Trustees of the Village of Woodstock, Vt., until Thursday, March 15,

Proposal notices continued on following page.

Leading Manufacturers

Of Supplies and Equipment for Municipal and Public Work

Brick, Paving, Building and Sewer.

W. H. Arthur, Stamford, Conn.
Barr Clay Co., Streator, Ill.
Bessemer Limestone Co., Youngstown, O.
Clearfield Clay Working Co., Clearfield, Pa.
Collinwood Shale Brick Co., Rose Bldg., Cleveland, Ohio.
Federal Clay Products Co., 232 5th Ave., Pittsburg, Pa.
Flint Brick & Coal Co., Des Moines, Ia.
McAvoy Vitified Brick Co., Philadelphia, Pa.
Metropolitan Paving Brick Co., Canton, O.
New England Steam Brick Co., Providence, R. I.
Pittsburg-Buffalo Co., Frick Bldg., Pittsburg, Pa.
Purinton Paving Brick Co., Galesburg, Ill.
Suburban Brick Co., Wheeling, W. Va.
Texas & Pacific Coal Co., Fort Worth, Texas.
Western Brick Co., Danville, Ill.

Road Machinery, Rock Crushers, Etc.

Acme Road Machinery Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago.
Buffalo Steam Roller Co., Buffalo, N. Y.
Climax Road Machine Co., Marathon, N. Y.
Erre Machine Shops, Erie, Pa. Asphalt Rollers.
Kelly-Springfield Road Roller Co., Springfield, O.

Roofing and Roofing Material.

A. L. Barber Asphalt Co., 17 Battery Place, N. Y.
California Asphaltum Sales Agency, Mills Building, San Francisco, Cal.
Robt. A. Keasbey Co., 100 N. Moore St., N. Y.
Warren Bros. Co., Boston, Mass.
Warren Co., E. B., Washington, D. C.

Paving Materials (See also Brick).

A. L. Barber Asphalt Co., 17 Battery Place, N. Y.
Bevier Improved Wood Pavement Co., St. Paul Bldg., New York.
California Asphaltum Sales Agency, Mills Bldg., San Francisco, Cal.
Central Bitulithic Paving Co., Detroit, Mich.
Erimus Slag Paving Brick Co., 16 Exchange Pl., New York.
Globe Asphalt Co., 405 Bakewell Bldg., Pittsburg, Pa.
Southern Bitulithic Co., Nashville, Tenn.
Standard Bitulithic Co., 253 Broadway, N. Y.
U. S. Wood Preserving Co., 29 Broadway, N. Y.
Wadsworth Stone & Paving Co., Pittsburg, Pa.
Warren Brothers Co., Boston, Mass.
Warren Asphalt Paving Co., Cambridge, Mass.

Sewer Pipe.

East Ohio Sewer Pipe Co., Irondale, O.
Federal Clay Products Co., Pittsburg, Pa.
Great Northern Sewer Pipe Co., Empire, O.
Ohio River Sewer Pipe Co., Empire, O.
Pittsburg-Buffalo Co., Pittsburg, Pa.
Stratton Fire Clay Co., Empire, O.

Street Cleaning and Sprinkling Equipment.

Austin-Western Co., Chicago, Ill.
Etnyre, E. D., & Co., Oregon, Ill.
Sanitary Street Flushing Machine Co., St. Louis.
Studebaker Bros. Mfg. Co., South Bend, Ind.
Wirt & Knox Mfg. Co., 20 No. 4th St., Philadelphia, Pa.

Wagons and Carts.

Acme Road Machinery Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago, Ill.
Climax Road Machine Co., Marathon, N. Y.
Fulton & Walker Co., Philadelphia, Pa.
Hawwood Wagon Co., Baldwinville, N. Y.
Hill Cart & Wagon Works, Jersey City, N. J.

Studebaker Bros. Mfg. Co., South Bend, Ind.
Tiffin Wagon Co., Tiffin, Ohio.
Troy Wagon Works Co., Troy, O.
Watson Wagon Co., Centre & Buck Sts., Canastota, N. Y.

Water-Works Equipment and Supplies.

Artesian Well & Supply Co., Providence, R. I.
Well Drilling.
Bethlehem Fdy. & Mach. Co., South Bethlehem, Pa. Pumping Machinery.
Buffalo Meter Co., Buffalo, N. Y. Meters.
Central Foundry Co., 116 N. Nassau St., N. Y. Pipe.
Hersey Mfg. Co., So. Boston, Mass. Meters.
Jackson Filter Mfg. Co., St. Louis. Water Filters.
Ellis-Ford Pipe Cutter Co., Detroit, Mich., Pipe Cutters.
Mueller Mfg. Co., H., Decatur, Ill. Supplies.
Neptune Meter Co., New York. Meters.
Pittsburg Filter Mfg. Co., Pittsburg, Pa. Filtration Plants for Water-Works.
Pittsburg Meter Co., E. Pittsburg, Pa. Meters.
Rife Pumping Engine Co., 111 Broadway, N. Y.
John Simmons Co., N. Y. Supplies.
Union Water Meter Co., Worcester, Mass. Meters.
Washington Pipe & Foundry Co., Tacoma, Wash. Pipe, Hydrants, Valves.
Water-Works Equip. Co., 180 B'way, N. Y. Supplies.

Fire Extinguishing Equipment.

American-La France Fire Engine Co., Elmira, N. Y. Fire Engines and all Fire Department Equipment.
Eureka Fire Hose Co., 13 Barclay St., N. Y. Hose.
Fabric Fire Hose Co., Duane & Church Sts., N. Y. Hose.
Firestone Tire & Rubber Co., Akron, O. Rubber Tires.
Gamewell Fire Alarm Telegraph Co., N. Y. Fire and Police Alarm Systems.
Glazier Nozzle & Manufacturing Co., Indianapolis, Ind. Nozzles.
Seagrave Co., Columbus, O. Apparatus and Supplies.
Star Electric Co., Binghamton, N. Y. Fire Alarm Systems.

Miscellaneous.

Balto. Enamel & Novelty Co., Baltimore, Md. Enamelled Signs.
Bergner Mfg. Co., Canton, O. Everything in Sheet Steel. Metal Furniture.
Carson Trench Machine Co., Boston. Trench Machinery.
Cleveland Street Lighting Co., Cleveland, Ohio. Street Lamps.
Climax Supply Co., 712 Marquette Building, Chicago. Sign Posts.
Contractors Supply & Equipment Co., Chicago. Concrete Mixers, Contractors' Supplies.
Davison Foundry Co., 103-109 W. Monroe St., Chicago. Catch Basins.
Hetherington & Berner, Indianapolis. Asphalt Plants.
John Maslin & Sons, Jersey City, N. J. Contractors' Pumps.
Okonite Co., Ltd., New York. Wire.
Pacific Flush Tank Co., Chicago. Flush Tanks.
Shields, W. S., 1715 Marquette Bldg., Chicago. Valves for Sewage Disposal Works.
Soltmann, E. G., 125 E. 42d St., N. Y. Drawing Materials.
Southern Creosoting Co., Slidell, La. Creosoted Wood.
Southern Exchange Co., New York. Poles for Street Lighting.
Universal Safety Tread Co., 45 Broadway, New York. Safety Treads.
Warner Co., Chas., Wilmington, Del. Cement.
Weber Steel Concrete Chimney Co., Marquette Bldg., Chicago. Concrete Chimneys.

When in need of Apparatus, Machinery or Supplies, consult the MUNICIPAL JOURNAL AND ENGINEER. We will promptly furnish names, addresses and full information, also catalogues or printed matter if desired.

Proposals.

1906, at 10 o'clock in the forenoon, at which time they will be publicly opened and read.

A certified check for \$300, made payable to the order of the treasurer of the village, must accompany the bid as a guarantee that the bidder, if successful, will enter into a contract according to the terms of his proposal.

The engineer's approximate estimate of the principal items of work is as follows:

20,000 lineal ft. of 8-in. vitrified pipe sewer of best quality.

50 manholes.

Proposals must be made on blanks furnished by the Board. Forms of contract and specifications may be seen, and blank forms of proposal, and bonds may be obtained at the office of the Clerk of the Board on Central Street.

The Board reserves the right to reject any or all bids.

By order of the Board of Trustees.

FREDERICK CHAPMAN, Clerk.

Sewerage System CITY OF GAINESVILLE, FLORIDA.

GAINESVILLE, FLA., January 30, 1906.

Sealed proposals will be received by the Board of Public Works of the city of Gainesville, Florida, until 3 o'clock P. M., March 7th, 1906, for constructing a Sanitary Sewerage System in the city of Gainesville, Florida, and for furnishing material for same. Work will embrace approximately twelve miles of pipe, sewers from six to fifteen inches in diameter. A certified check for One Thousand Dollars (\$1,000.00), or a satisfactory Guaranteed Bidders' Bond, must accompany each bid.

Plans and specifications will be on file and may be seen at the office of the Engineer, and copies of the specifications and forms, etc., may be obtained from the Secretary of the Board of Public Works. The right is reserved to reject any and all bids.

W. W. HAMPTON,

Secretary Board of Public Works of the City of Gainesville, Fla.

WM. W. LYON, Consulting Engineer.

Sewerage System, East of Woodbine Avenue

TORONTO, CAN.

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Tuesday, March 6, 1906, for the construction of Sewers, Pumping Stations, Septic Tanks and Bacteria Beds for a system of sewerage east of Woodbine avenue, Toronto, Canada.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Plans may be seen, and specifications and forms of tender obtained, at the office of the City Engineer, Toronto.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

EMERSON COATSWORTH (Mayor),
Chairman Board of Control.

CITY HALL, TORONTO, January 24, 1906.

Paving

MANISTEE, MICH.

Scaled bids will be received by the City Clerk, Manistee, Mich., up to 2 o'clock P. M., Thursday, March 1, 1906, for paving and combined curb and gutter on River, Smith, Maple and Washington streets.

Approximately: 2,150 sq. yds. street railway track paving, to be of brick; 14,700 sq. yds. balance of streets, to be either of brick, bitulithic or bituminous macadam, and 7,600 lin. ft. combined curb and gutter.

Proposals will be received for the entire work complete, certified check \$1,500.00, and for combined curb and gutter alone, certified check \$250.00. Plans may be seen and specifications obtained at the office of the City Surveyor.

C. A. GNEWUCH, City Clerk.
GEO. B. PIKE, City Surveyor.

Paving

BIDS WANTED.

Notice is hereby given that bids for paving, curbing and drain tile on Houston avenue in this city, from the intersection of its northerly end with Ash street, to the intersection of its southerly end with Broadway street, will be received at my office until 8 o'clock P. M., March 13, 1906, said bids to be opened and considered at a regular meeting of the City Council to be held at said time.

Said paving is to be done with asphalt according to plans and specifications now on file in the office of City Engineer J. E. Carroll.

All bids must be accompanied by a certified check to the amount of \$2,000, made payable to the order of R. H. Robertson, City Treasurer, conditioned upon the execution of the contract within ten days after the award of same.

The right to reject any or all bids is reserved.

A. M. CHILDS, City Clerk.
CROOKSTON, MINN., Jan. 26th, 1906.

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GENERAL OFFICES, CUTLER BUILDINGS, ROCHESTER, N. Y.

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